Expansion of the ENERGY STAR® Refrigerator Specification:

Additional Research Requested at July 18, 2002 Public Stakeholder Meeting at US DOE

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Overview

On July 18, 2002, US DOE held a public meeting for ENERGY STAR stakeholders, particularly those interested in the proposed expansion of the ENERGY STAR criteria to include various additional sizes and configurations of refrigerators and freezers.

As a result of this meeting, several ENERGY STAR stakeholders outlined several items requiring further research:

- Mid-Size Refrigerator Shipments and Energy Savings Estimates
- Compact Refrigerator Cost-Effectiveness Analysis
- National Aggregate & Cumulative Savings of Various ENERGY STAR Labeled Products & Refrigerators

Below is a summary of the additional research.

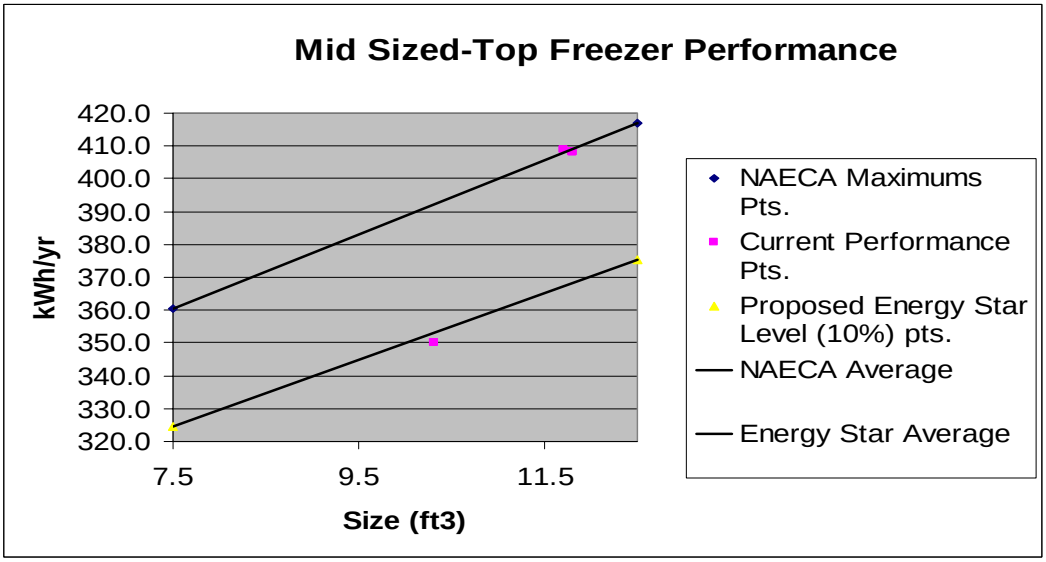
Mid-Size Refrigerators

Stakeholders requested additional research to clarify the calculation of the aggregate energy savings and shipment numbers for mid-size refrigerators (7.75-12.5 ft^3 top freezer, 7.75-18.5 ft^3 bottom freezer & side by side). Upon further inquiry, D&R International (US DOE contractor) concludes that shipment data for refrigerators are available to the public in aggregate form only, and therefore a breakdown of shipment data by size and configuration is not available at this time, without significant cost or, alternatively, voluntary disclosure of data by manufacturers.

Industry sources including AHAM, NPD, and Lawrence Berkeley National Labs, all provided information in aggregate, and did not have shipment data segmented by size and configuration. Therefore, the current estimate of 1.9 million units of mid-size refrigerator shipments will be used for energy savings analysis, pending additional data.

The California Energy Commission (CEC) collects data for *imports* of refrigerators (though this included models from U-Line and W.C. Wood, which we assume is due to foreign production of these units). The CEC database indicated approximately 300,000 units of mid-size refrigerators (using the import size definition of 6.5-13.5 ft^3) were shipped in 2000. Most of these were top freezer configuration. As indicated, the CEC report also did not break down the data by the exact sizes required (7.75-12.5 ft^3, top freezer) for analysis, but it did provide another useful reference point. Using the CEC data, graph 1 was created showing the NAECA Standard and the proposed ENERGY STAR levels. A few data points from existing refrigerator models are plotted as well.

Graph 1-Mid Sized-Top Freezer Refrigerator Performance



Compact Refrigerators

Stakeholders inquired about the cost effectiveness of the ENERGY STAR label for compacts and whether the price points for the compact category would justify or support a price premium. Price premiums for compacts that would carry the ENERGY STAR label are difficult to determine, as are premiums for existing full-size refrigerators carrying the ENERGY STAR label. Listed below are assumptions made to create a simple model evaluating the cost effectiveness of an ENERGY STAR labeled compact refrigerator.

- Average compact price/cubic foot: $58
- Assumed price premium for ENERGY STAR labeled compact: 10%
- Average compact refrigerator size: 4 ft^3
- Savings of a 4 cubic foot ENERGY STAR compact: 60 kWh/yr
- Average price of electricity $0.083/kWh

Surveys of approximately a dozen models from a variety of national retailers provided the average price per cubic foot of a compact refrigerator. Using the above figures, a 5-year simple payback is calculated using the energy savings as future cash flow (non-discounted) and the 10% price premium as the initial investment. This is an approximate model of the cost effectiveness of an ENERGY STAR labeled compact refrigerator, though this will vary widely depending on actual price premiums and energy performance. Note that many premium compacts have a much higher price/cubic foot.

Aggregate National Energy Savings

Lawrence Berkeley National Labs performs periodic analysis on regulatory and non-regulatory (or voluntary) national energy policies. Recently, Berkeley Lab published *Savings Potential of ENERGY STAR Voluntary Programs*. Refrigerators were included in the report. Table 1 shows some selected figures for the requested cumulative and annual savings of the existing ENERGY STAR refrigerator program:

Table 1-Energy Savings of ENERGY STAR Refrigerators

ENERGY STAR labeled Refrigerators Savings, 2000	**Cumulative, Projected ENERGY STAR Labeled Refrigerator Savings, 2001 to 2010**
• 609 GWh (2.1 TBtu) site Or • 6.4 TBtu primary	• 7.6 TWh (26.2 TBtu) site Or • 83 TBtu primary

Table 2-Energy Savings of ENERGY STAR Appliances

ENERGY STAR Labeled Appliances	**Energy Saved (GWh/year)**
Refrigerators	615
Clothes Washer[1]	415
Room Air Conditioners	215
Dishwashers[1]	127

[1] electrical savings only, gas not included

The numbers in table 2 demonstrate the relative savings of the various ENERGY STAR labeled appliances in the year 2000. Refrigerators are the leader among appliances. The addition of mid-size, compacts, and freezers will grow this number by about 5% or an estimated 30 GWh/year if the anticipated 10% market penetration is achieved.